Fact Sheet 9

Designing Safe Urban Thoroughfares

This fact sheet introduces planning, engineering, and design practitioners to the Institute of Transportation Engineer's recommended practice (RP) *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* as a tool for designing urban streets that are compatible with and supportive of the surrounding context and community. This fact sheet will introduce readers to the safety aspects that should be considered in developing walkable urban thoroughfares.

Beyond Conventional Approaches

Two factors are key to urban thoroughfare safety:

- **Conflicts** – the location, number, and magnitude of vehicle-vehicle and vehicle-pedestrian or bicycle conflicts needs to be reduced, simplified, and controlled through design and operation; this requires balancing mobility needs with those of adjacent land uses and activities.
- **Speed** – stopping sight distance and crash severity increase with speed, but the desired urban environment frequently constrains sight distance; this often points to the need to lower target speeds (highest operating speed given desired conditions) for design.

The conventional approach to addressing traffic safety seeks to minimize the consequences of driver error through a "forgiving" design that allows drivers to recover from errant maneuvers. This is achieved by designing roads with wide lanes, shoulders, and fixed object clearances. However, this design approach can have a mixed effect on crash frequency and severity on urban streets, and it could unexpectedly facilitate higher speeds (Ewing, Dumbaugh, 2009; Swift et al. 2006).

The urban thoroughfare is a complicated environment, where the needs of pedestrians, bicyclists, transit users, and streetside activities must be considered along with those of trucks, buses, and emergency response vehicles and general purpose traffic. Context sensitive urban thoroughfare design requires evaluating the needs of the users of the facility in a manner that considers mobility and safety in combination with local objectives for urban activity, economic development, and character. The selection of appropriate design criteria is key to developing suitable design solutions.

Considering Urban Transportation Safety

The design of a walkable urban thoroughfare begins by considering or defining the following attributes:

- Thoroughfare type and function;
- Predominant land use and ground floor use;
- Anticipated streetside activity;
- Target speed range;
- Pedestrian separation from moving traffic;
- Streetside width;
- Block length;
- Pedestrian crossing location, frequency, and control;
- Median width;
- Vehicular access across sidewalks;
- Curb parking; and
- Curb return radius.

Speed and the Urban Environment

Vehicle speed is a major determinant of crash severity and is critical when a vulnerable user such as a pedestrian, bicyclist, or motorcyclist is involved. The nature of the urban environment, with its visual distractions and multimodal context, also makes lower target speeds more appropriate.

Designing for Safety

Conventional thoroughfare design emphasizes vehicular mobility and access to adjoining land uses, primarily using functional classification, traffic volume, automobile level of service, and design speed as the determinants for design parameters.

A context sensitive solutions (CSS) approach enriches the design process to better integrate thoroughfares with their surroundings. The result in many communities is a new emphasis on multimodal safety and thoroughfares that provide transportation mobility and support for adjacent land uses.

Higher vehicle speeds increase the amount of force to be absorbed in a crash. Especially for pedestrians and bicyclists, minor increases in speed can profoundly affect crash survival rates (see **Figure 1**).

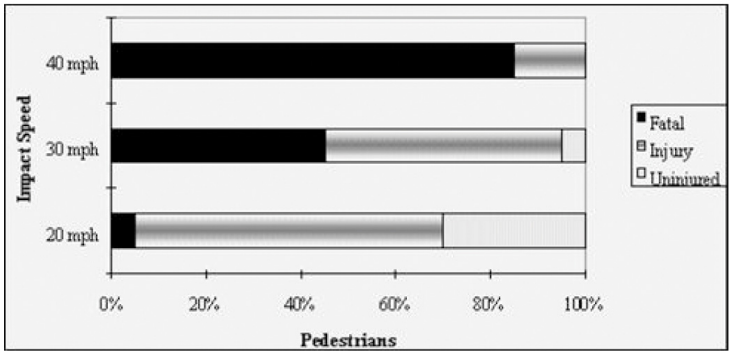

Figure 1 Pedestrian survival rate by vehicle impact speed. *Source: FHWA, http://safety.fhwa.dot.gov/ped_bike/pssp/background/psafety.cfm*

In some situations, vehicle speed also influences crash frequency. Crash avoidance sometimes requires drivers to brake quickly in response to another driver entering the street. Higher vehicle speeds increase stopping sight distances (distance a vehicle travels from time a driver first observes a potential conflict on the street to where he or she can stop the vehicle (see **Figure 2**).

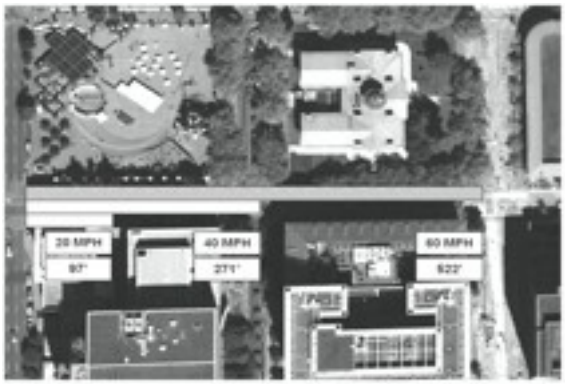

Figure 2 Speed and stopping sight distance. *Source: Dumbaugh.*

Because conflicts with pedestrians, cyclists, and other motorists are inherent in urban environments, speed is one of the most important factors that can influence the incidence or avoidance of a crash event.

CSS for walkable urban thoroughfares involves creating a safer environment in which the street features and surroundings encourage the driver to operate at the desired speed (AASHTO *Guide for Achieving Flexibility in Highway Design*, 2004. Design should start with selection of a a target speed that is appropriately safe for all users of the thoroughfare followed with the selection of features that can help reduce speeds when used in proper combination, such as:

- Signal timing and progression speed;
- Narrower travel lanes;
- Reduced number of through and turn lanes;
- Curb extensions and medians to narrow crossing distance;
- Curb parking and/or visual enclosure of the street using buildings, streetscaping, etc. to create side friction;
- Smaller curb return radii to slow turning vehicles and shorten crossing distance;
- Paving material texture;
- Proper establishment of speed limits and warning signs; and
- Other features described in the RP.

The RP recommends keeping the target speed between 25–35 mph for major thoroughfares. This speed range can improve the user's perception of the street and better allow for the types of maneuvers associated with constrained, multimodal urban places.

The width of the traveled way also affects users' perceptions and can influence speed, where wider lanes can sometimes result in higher travel speeds. Furthermore, wide streets can act as a barrier to pedestrians in urban areas, where frequent crossings are both necessary and desirable. In urban areas, walkable thoroughfares are limited to the minimum number of lanes that enable the design to meet objectives for the thoroughfare, its surroundings, and the adjoining corridor.

Reducing Conflicts on Walkable Thoroughfares

Most conflicts occur at intersections, vehicle access points (e.g., driveways), and pedestrian crossings. Users of all modes expect to pass these points safely, with minimal delay and with few conflicts. On walkable urban streets, users need to take turns with other modes in a slower and more vigilant manner. Successful design needs to:

- Minimize conflicts between modes;
- Phase and time signals to accommodate and separate automobiles from pedestrians crossing the street as needed;
- Provide appropriate level of service for all modes to minimize impatience that often leads to risk taking;
- Provide good visibility for all motorists and nonmotorists;
- Keep pedestrian crossing distances short;
- Design for low speeds at pedestrian-vehicle conflict points such as short radius curb returns (e.g., using short radius curb returns to slow turning traffic at pedestrian crosswalks);
- Keep intersections simple and fully comprehensible;
- Make facilities accessible for all users through visual, audible, and tactile methods; and
- Make crossings highly visible.

The Safety Benefits of Walkable Streets

Walkable urban thoroughfare principles can enhance urban traffic safety (**Figures 3** and **4**). One study compared safety effects of pedestrian-oriented "livable" street treatments to auto-oriented arterial streets. It reported 40 percent fewer total crashes per vehicle-mile traveled, 27 percent fewer injurious crashes, and the virtual elimination of fatalities involving all road users (Dumbaugh, 2005). Similarly, a study of rural villages in Maine found that streets with pedestrian-oriented streetscape treatments had half the crash rate as those with design auto-oriented treatments (Ossenbruggen, Pendharkar, and Ivan, 2001). Streetscape features tend to enclose the street and create visual friction, which in turn leads to a reduction in operating speeds and improved driver expectancy (Dumbaugh, 2006; Ivan, Garrick, and Hanson, 2009). The result is a significant reduction in both the frequency and severity of traffic crashes.

These safety benefits are the result of a strong emphasis on multimodal accommodations that result in truly walkable urban thoroughfares.

Safety for all users should be the first and foremost consideration of the urban thoroughfare designer. The RP provides guidance and tools the practitioner may select if appropriate for the safety challenges unique to the urban context.

Figure 3 Four-lane urban thoroughfare with midblock crosswalk. *Source: Eric Dumbaugh.*

Figure 4 Walkable street with streetscape, parking. *Source: TTI.*

Institute of Transportation Engineers, 1627 Eye Street, NW, Suite 600, Washington, DC 20006 USA; Phone: 202-785-0060; www.ite.org.
This project was funded by FHWA's Office of Planning, Environment and Realty's Surface
Transportation Environment and Planning Cooperative Research Program and the Environmental Protection Agency.
Download the recommended practice and additional fact sheets at: www.ite.org/css/ or www.contextsensitivesolutions.org.